

## Claims:

1. A method of purifying calcium sulphate ( $\text{CaSO}_4$ ), particularly enabling  $\text{CaSO}_4$  to be separated from other materials, said method employing a chemical chelating reagent in conjunction with an aqueous medium and pH control to selectively precipitate calcium sulphate.
2. A chemical process for the purification of  $\text{CaSO}_4$  that utilises the ability of an aqueous solution of a chelating agent to selectively dissolve  $\text{CaSO}_4$  wherein the chelating agent is one which is soluble in water over a wide range of pH, but which chelates calcium only over a relatively narrow pH range thereby enabling an initial extraction to be carried out at a predetermined pH and  $\text{CaSO}_4$  to be recovered by titration to a different pH (usually a lower pH) following a mechanical treatment, such as centrifugation or filtration, to separate the aqueous chelate solution from insoluble material.
3. A chemical process according to claim 2 wherein the aqueous solution of the chelating agent is recycled for another round of  $\text{CaSO}_4$  extraction following titration back to the original pH.
4. A method for the recovery of calcium sulphate from a crude or contaminated calcium sulphate source, in essentially pure form, by the method of dissolving the material in an aqueous solution of a calcium-chelating agent at a pH at which chelation occurs (the extraction step), followed by removal of insoluble residuum by a suitable physical technique such as, but not limited to, centrifugation or filtration (the separation step), followed by recovery of the calcium sulphate by acidification to a pH at which calcium sulphate, but

not the chelating agent, precipitates (the recovery step).

5. A method according to claim 1 or claim 4 wherein the calcium chelating agents are selected from 4-(carboxymethyl)-2-(trimethylamino)pentane-1,5-dicarboxylic acid, 2-(carboxymethyl)-2-(trimethylamino)butane-1,4-dicarboxylic acid, 2-(carboxymethyl)-3-(trimethylamino)-butane-1,4-dicarboxylic acid, ethane 1,2-diamine N,N,N',N' tetra-acetic acid (EDTA) and sodium salts of such agents and the like polydentate ligands comprising organic chelating compounds modified by addition of or substitution with a solubilising group, e.g. a quaternary ammonium group, which is soluble in acid pH ranges, especially remaining soluble below pH4.

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6. A method according to claim 5 wherein the chelating groups are selected from sulphonic and carboxylic groups.

7. A process according to claim 2 or claim 3 wherein the chelating agents include at least one of the following : 4-(carboxymethyl)-2-(trimethylamino)-pentane-1,5-dicarboxylic acid, 2-(carboxymethyl)-2-(trimethylamino)butane-1,4-dicarboxylic acid, 2-(carboxymethyl)-3-(trimethylamino)-butane-1,4-dicarboxylic acid, and the like polydentate ligands comprising organic chelating compounds modified by addition of or substitution with a solubilising group, e.g. a quaternary ammonium group, which is soluble in acid pH ranges, especially remaining soluble below pH4.

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8. An apparatus for the purification of calcium sulphate, comprising a vessel for receiving crude or

FOOTNOTES

contaminated material containing calcium sulphate to be purified, at least one calcium chelating reagent and an aqueous medium, whereby said material and said reagent are intimately admixed in said aqueous medium to form an extraction liquor, means for separating insoluble materials from said extraction liquor, means for adjusting the pH of the extraction liquor by supply of acidic or basic media into said vessel, and means for recovery of purified calcium sulphate.

9. Use of 4-(carboxymethyl)-2-(trimethylamino)-pentane-1,5-dicarboxylic acid, 2-(carboxymethyl)-2-(trimethylamino)butane-1,4-dicarboxylic acid, 2-(carboxymethyl)-3-(trimethylamino)-butane-1,4-dicarboxylic acid, and the like polydentate ligands including organic chelating compounds modified by addition of or substitution with a solubilising group, e.g. a quaternary ammonium group, which is soluble in acid pH ranges, especially remaining soluble below pH4, in a process for treating a material comprising calcium sulphate for the purposes of separating said calcium sulphate from other components of said material.

10. Use according to claim 9 wherein the material to be treated is selected from natural gypsum minerals, waste materials comprising calcium sulphate, phosphogypsum, construction waste materials and demolition materials containing gypsum to be recovered and recycled.

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